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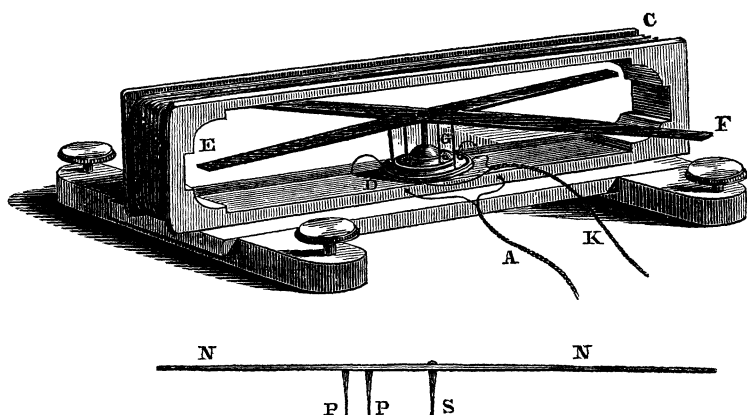
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ARTICLE XII.

Engraving and Description of a Rotatory Multiplier, or one in which one or more Needles are made to revolve by a Galvanic Current. By R. Hare, M. D., Professor of Chemistry in the University of Pennsylvania. Read December 7, 1838.

THE preceding engraving represents a rotatory galvanometer, or multiplier, which I contrived in November 1836, and which must have value as an addition to the amusing, if not to the useful implements of science. It is well known that by passing a temporary discharge through the coil of a multiplier, the needle may be made to perform a revolution, whereas if the current be continuously applied, the movement is checked as soon as the situation of the poles is reversed. To produce a permanent motion, the discharge must be allowed to take place only when the poles are in a favourable position, relatively to the excited coil. This object I attained by means of two pins, descending from the needle perpendicularly, so as to enter two globules of mer-

cury, communicating, on one side, with a galvanic pair, on the other with the coil of the multiplier. In the next place, by winding over the first coil, another of similar length, but in a direction the opposite of that in which the first coil was wound, I was enabled, by two other globules, situated so as to communicate severally with the lower ends of the pins, at the opposite side from that on which the first mentioned globules were, to cause an impulse at every semi-revolution.

The one coil being wound to the right, the other to the left, the alternate effect of each upon the needle was similar in opposite parts of the orbits described by the pins. Lastly, a second needle, furnished with pins in like manner, being fastened at right angles to the first, so as to form with it a cross, as represented in the engraving, each needle is made to receive two impulses during every revolution. Hence one of Danell's sustaining batteries, as made by Newman, is quite adequate to cause a revolution as rapid as consistent with a due degree of stability in the mercurial globules employed.

One end of each coil, by means of the branching wire A, communicates with one pole of the galvanic pair; the other ends of the coils terminate in mercurial globules contained in cavities on opposite sides of the wooden disc G, upon the centre of which the spindle of the magnetic needle rests. The branches of the wire K proceeding from the other galvanic pole, terminate in globules situated in the vicinity of those above mentioned, so that as the needles revolve, the pins proceeding therefrom perpendicularly may touch a pair of the globules first on one side and then on the other. Whenever this contact takes place, the circuit is completed, and a discharge is effected through one or the other of the coils of the multiplier.

Supposing E and F to be north poles, a discharge through one of the coils will cause E to move off a quarter of a circle, or more. As this ensues, the pins of F will come in contact with the globules which those of E touched before. Of course F will be propelled so as to cause the pins of E to reach the pair of globules at G, which, completing the circuit of a coil wound in a way the opposite of that first mentioned, concurs with that coil in its influence, so as to promote the rotation previously induced. The same result ensues when the

pins proceeding from F come in contact with the globules situated at G, and when E returns to its original starting point. It follows that by a repetition of the process the galvanic action is sustained. The phenomenon is as well illustrated by employing the single needle, N, N, as by two, but the most pleasing and energetic effect is produced by the crossed needles. In this simple form the spindle on which the needle rests and revolves is represented at S; the pins at P, P. Each coil, consisting of copper bell wire, is about thirty feet in length, and is contained in the groove C. The frame of the multiplier is constructed of mahogany and is levelled by the milled headed screws. on the ends of which it is supported.